

Claims

We claim:

- 1 1. A method for maximizing residual power along routes in a wireless network including a plurality of battery operated nodes, comprising:
 - 3 discovering a plurality of routes from a destination node to a source node via intermediate nodes of the network;
 - 5 measuring a residual power in the battery of each intermediate node;
 - 6 determining a power cost associated with each route according the residual power of the intermediate nodes; and
 - 8 selecting a particular route for transferring data from the source node to the destination node, the particular route having a least power cost.
- 1 2. The method of claim 1, further comprising:
 - 2 determining a delay cost associated with each route; and
 - 3 selecting the a particular route having a least delay cost.
- 1 3. The method of claim 1, further comprising:
 - 2 associating a time of discovery with each route; and
 - 3 selecting the particular route having a most recent time of discovery.
- 1 4. The method of claim 1, in which the network is ad-hoc.
- 1 5. The method of claim 1, further comprising:
 - 2 storing a routing in each node.

1 6. The method of claim 1, further comprising:
2 quantizing the residual power to a power level to determine the power
3 cost.

- 1 7. The method of claim 6, further comprising:
 - 2 participating in the route if the power level is a least power level;
 - 3 not participating in the route if the power level is a highest level; and
 - 4 participating in the route if the power level is an intermediate power
 - 5 level, and increasing the power cost according to the power level.

1 8. The method of claim 6, in which an initial power of an n^{th} node is E
 2 joules, and the residual power in the n^{th} node at time t is $R(t)$ joules, and the
 3 power cost for using n^{th} node as an intermediate node is $P(n)$, and the power
 4 level $L(t)$ of the n^{th} is determined by .

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5      if       $R(t) \leq E * \alpha$  ,           then  $L(t) = 3$  ;
6      else if  $E * \alpha < R(t) \leq E * \beta$  ,   then  $L(t) = 2$  ;
7      else if  $E * \beta < R(t) \leq E * \gamma$  ,   then  $L(t) = 1$  ;
8      else  $L(t) = 0$  .

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9 where α , β , and γ are numbers less than 1.0 and monotonically increasing
 10 according to $\alpha < \beta < \gamma$.

1 9. The method of claim 1, in which the discovering uses dynamic source
2 routing.

1 10. The method of claim 1, in which the discovering uses ad-hoc on-demand
2 distance vector routing.

1 11. A method for maximizing residual power along routes in a wireless
2 network including a plurality of nodes, each node having an address and a
3 battery, comprising:
4 broadcasting a request packet, the request packet including the address
5 of a source node and the address of a destination address;
6 receiving the request packet in an intermediate node;
7 measuring a residual power in the battery of the intermediate node;
8 determining a power cost associated with each route according the
9 residual power of the intermediate nodes; and
10 sending a reply packet to the source node, the reply packet including
11 the address of the intermediate node and the power cost;
12 repeating the broadcasting , receiving, measuring, determining and the
13 sending until the request packet reaches the destination node;
14 constructing a route in a routing table in the source node from the
15 reply packets, the route having the associated power cost;
16 selecting a particular route for transferring a data packet from the
17 source node to the destination node, the particular route having a least power
18 cost.

1 12. A wireless network including a plurality of battery operated nodes,
2 comprising:
3 means for discovering a plurality of routes from a destination node to
4 a source node via intermediate nodes of the network;
5 means for measuring a residual power in the battery of each
6 intermediate node;

7 means for determining a power cost associated with each route
8 according the residual power of the intermediate nodes; and
9 means for selecting a particular route for transferring data from the
10 source node to the destination node, the particular route having a least power
11 cost.